CLAIMS

What is claimed is:

1. A fire suppression apparatus comprising:

a housing defining a first opening therein, a second opening therein and a flow path providing fluid communication between the first opening and the second opening; and

a gas-generating device located and configured to provide a flow of a gas into the flow path such that the flow of the gas draws a volume of ambient air from a location outside the housing, through the first opening and into the flow path.

2. The fire suppression apparatus of claim 1, wherein the gas-generating device further includes a nozzle through which the first gas flows into the flow path.

3. The fire suppression apparatus of claim 2, wherein the nozzle is configured to accelerate the flow of the first gas to a supersonic velocity.

4. The fire suppression apparatus of claim 2, wherein the nozzle is configured to accelerate the flow of the first gas to a substantially sonic velocity.

5. The fire suppression apparatus of claim 2, wherein the gas-generating device further includes a solid propellant composition configured to generate the first gas upon combustion thereof.

6. The fire suppression apparatus of claim 5, wherein the solid propellant composition is configured to generate the first gas as an inert gas.

7. The fire suppression apparatus of claim 5, wherein the solid propellant composition is configured to generate a volume of at least one of N_2, H_2O and CO_2 as the first gas.

8. The fire suppression apparatus of claim 5, further comprising an igniting device configured to ignite the solid propellant composition.

9. The fire suppression apparatus of claim 8, wherein the igniting device includes at least one of a squib, a semiconductor bridge and a conductive wire.

10. The fire suppression apparatus of claim 8, further comprising an igniting composition in contact with the igniting device.

11. The fire suppression apparatus of claim 10, wherein the igniting composition is configured to produce a volume of hot gas upon ignition thereof.

12. The fire suppression apparatus of claim 10, wherein the igniting composition is configured to produce a mass of heated slag upon ignition thereof.

13. The fire suppression apparatus of claim 10, wherein the gas-generating device further includes a filter disposed between the solid propellant composition and the nozzle.

14. The fire suppression apparatus of claim 13, wherein the filter comprises at least one of screen mesh and shot material.

15. The fire suppression apparatus of claim 2, further comprising a diffuser disposed within the flow path located and configured to alter a velocity of the first gas and to effect mixing of the first gas with the volume of ambient air drawn into the flow path and thereby form a gas mixture.

16. The fire suppression apparatus of claim 15, further comprising at least one conditioning apparatus disposed within the flow path.

17. The fire suppression apparatus of claim 16, wherein the at least one conditioning apparatus includes an oxygen-getting device disposed between the first opening and the diffuser, wherein the oxygen-getting device is configured to reduce a level of oxygen in the volume of ambient air as it flows therethrough.

18. The fire suppression apparatus of claim 17, wherein the oxygen-getting device includes an oxygen reactive material.

19. The fire suppression apparatus of claim 18, wherein the oxygen reactive material includes at least one of iron, nickel, copper, zirconium and titanium.

20. The fire suppression apparatus of claim 17, wherein the oxygen-getting device is thermally coupled to the nozzle.

21. The fire suppression apparatus of claim 17, further comprising a plurality of thermally conductive fins coupled with the gas-generating device.

22. The fire suppression apparatus of claim 21, wherein the plurality of thermally conductive fins is coupled with the nozzle of the gas-generating device.

23. The fire suppression apparatus of claim 22, wherein the plurality of thermally conductive fins is also coupled with the oxygen-getting device.

24. The fire suppression apparatus of claim 16, wherein the at least one conditioning apparatus includes an oxygen-getting device disposed between the diffuser and the second opening.

25. The fire suppression apparatus of claim 16, wherein the at least one conditioning apparatus includes an NO_X scavenger disposed between the diffuser and the second opening.

26. The fire suppression apparatus of claim 16, wherein the at least one conditioning apparatus includes a filter disposed between the diffuser and the second opening.

27. The fire suppression apparatus of claim 16, wherein the at least one conditioning apparatus includes a heat transfer device disposed between the diffuser and the second opening.

28. The fire suppression apparatus of claim 16, wherein the at least one conditioning apparatus is configured to be removed from the housing and replaced with another conditioning apparatus.

29. The fire suppression apparatus of claim 2, wherein the first opening includes a first plurality of openings and wherein the second opening includes a second plurality of openings.

30. The fire suppression apparatus of claim 29, wherein the housing is formed of a metallic material.

31. The fire suppression apparatus of claim 30, wherein the housing is formed of a material comprising steel.

32. The fire suppression apparatus of claim 2, wherein the gas-generating device is configured to be removed from the housing and replaced with another gas-generating device.

33. The fire suppression apparatus of claim 2, wherein the housing is substantially integral with a structure associated with an environment intended to be protected by the fire suppression apparatus.

34. The fire suppression apparatus of claim 33, wherein the structure includes a room of a building.

35. The fire suppression apparatus of claim 33, wherein the structure includes a cabin of a vehicle.

36. A fire suppression system comprising:

at least one fire suppression apparatus comprising:

a housing defining a first opening therein, a second opening therein and a flow path providing fluid communication between the first opening and the second opening;

a gas-generating device located and configured to provide a flow of a gas into the flow path such that the flow of the gas draws a volume of ambient air from a location outside the housing, through the first opening and into the flow path; and

a controller configured to generate a signal and transmit the signal to the at least one fire suppression apparatus upon the occurrence of a specified event, wherein the gas-generating device is configured to provide the flow of the first gas upon receipt of the signal from the controller.

37. The fire suppression system of claim 36, further comprising at least one sensor configured to generate and transmit a sensor signal to the controller.

38. The fire suppression system of claim 37, wherein the at least one sensor further comprises at least one of a smoke detector and a temperature sensor.

39. The fire suppression system of claim 37, wherein the at least one sensor is configured to detect the presence of a specified gas.

40. The fire suppression system of claim 36, further comprising at least one actuator configured to generate and transmit an actuator signal to the controller.

41. The fire suppression system of claim 36, further comprising at least one alarm device located and configured to receive a signal generated by alarm and provide an alarm indicator.

42. The fire suppression system of claim 41, wherein the at least one alarm device is configured to provide at least one of a visual indicator and an auditory indicator as the alarm indicator.

43. The fire suppression system of claim 36, wherein the gas-generating device further includes a nozzle through which the first gas flows into the flow path.

44. The fire suppression system of claim 43, wherein the nozzle is configured to accelerate the flow of the first gas to a supersonic velocity.

45 The fire suppression system of claim 43, wherein the nozzle is configured to accelerate the flow of the first gas to a substantially sonic velocity.

46. The fire suppression system of claim 43, wherein the gas-generating device further includes a solid propellant composition configured to generate the first gas upon combustion thereof.

47. The fire suppression system of claim 46, further comprising an igniting device configured to ignite the solid propellant composition.

48. The fire suppression system of claim 47, further comprising an igniting composition in contact with the igniting device.

49. The fire suppression system of claim 48, wherein the igniting composition is configured to produce a volume of hot gas upon ignition thereof.

50. The fire suppression system of claim 48, wherein the igniting composition is configured to produce a mass of heated slag upon ignition thereof.

51. The fire suppression system of claim 48, wherein the gas-generating device further includes a filter disposed between the solid propellant composition and the nozzle.

52. The fire suppression system of claim 43, further comprising a diffuser disposed within the flow path located and configured to alter a velocity of the first gas and to effect mixing of the first gas with the volume of ambient air drawn into the flow path and thereby form a gas mixture.

53. The fire suppression system of claim 52, further comprising at least one conditioning apparatus disposed within the flow path.

54. The fire suppression system of claim 53, wherein the at least one conditioning apparatus includes an oxygen-getting device disposed between the first opening and the diffuser, wherein the oxygen-getting device is configured to reduce a level of oxygen in the volume of ambient air as it flows therethrough.

55. The fire suppression system of claim 54, wherein the oxygen-getting device includes an oxygen reactive material.

56. The fire suppression system of claim 55, wherein the oxygen reactive material includes at least one of iron, nickel, copper, zirconium and titanium.

57. The fire suppression system of claim 54, wherein the oxygen-getting device is thermally coupled to the nozzle.

58. The fire suppression system of claim 53, wherein the at least one conditioning apparatus includes an oxygen-getting device disposed between the diffuser and the second opening.

59. The fire suppression system of claim 53, wherein the at least one conditioning apparatus includes at least one of an NO_X scavenger and a NH_3 scavenger disposed between the diffuser and the second opening.

60. The fire suppression system of claim 53, wherein the at least one conditioning apparatus includes a filter disposed between the diffuser and the second opening.

61. The fire suppression system of claim 53, wherein the at least one conditioning apparatus includes a heat transfer device disposed between the diffuser and the second opening.

62. The fire suppression system of claim 53, wherein the at least one conditioning apparatus is configured to be removed from the housing and replaced with another conditioning apparatus.

63. The fire suppression system of claim 43, wherein the first opening includes a first plurality of openings and wherein the second opening includes a second plurality of openings.

64. A fire suppression apparatus comprising:

a housing defining a first opening therein, a second opening therein and a flow path providing fluid communication between the first opening and the second opening;

a gas-generating device including a solid propellant composition disposed within a housing, wherein the solid propellant composition is configured to produce a gas upon combustion thereof;

an igniting device configured to ignite the solid propellant composition;

a nozzle coupled with the gas-generating device, wherein the nozzle is located and configured such that the gas flows through the nozzle into the flow path and also draws a volume of ambient air from a location outside the housing, through the first opening and into the flow path;

a filter disposed between the solid propellant composition and the nozzle;

a diffuser disposed within the flow path located and configured to alter a velocity of the first gas and to effect mixing of the first gas with the volume of ambient air drawn into the flow path and thereby form a gas mixture; and

at least one conditioning apparatus disposed within the flow path.

65. The fire suppression apparatus of claim 64, wherein the first opening further comprises a first set of openings and wherein the second opening further comprises a second set of openings.

66. The fire suppression apparatus of claim 64, wherein the at least one conditioning apparatus includes an oxygen-getting device configured to reduce a level of oxygen from the volume of ambient air.

67. The fire suppression apparatus of claim 66, wherein the oxygen-getting device is thermally coupled with the nozzle.

68. A method of suppressing fires, the method comprising:
providing a housing with a first opening and a second opening;
defining a flow path between the first opening and the second opening;
producing a fire-suppressing gas;
introducing the fire-suppressing gas into the flow path;
aspirating a volume of ambient air from a location external of the housing through the first opening and into the flow path;
mixing the volume of ambient air with the fire-suppressing gas to produce a gas mixture; and
discharging the gas mixture through the second opening.

69. The method according to claim 68, wherein producing a fire-suppressing gas includes producing an inert gas.

70. The method according to claim 68, wherein producing a fire-suppressing gas includes producing a gas comprising at least one of N_2, H_20, CO_2.

71. The method according to claim 68, wherein producing a fire-suppressing gas includes combusting a solid propellant composition.

72. The method according to claim 71, wherein combusting a solid propellant composition further includes igniting a second solid composition.

73. The method according to claim 72, wherein igniting a second solid composition includes producing a heated gas from the second solid composition.

74. The method according to claim 72, wherein igniting a second solid composition includes producing a molten slag from the second solid composition.

75. The method according to claim 68, wherein introducing the fire-suppressing gas into the flow path further includes introducing the fire-suppressing gas into the flow path at a supersonic velocity.

76. The method according to claim 68, wherein introducing the fire-suppressing gas into the flow path further includes introducing the fire-suppressing gas into the flow path at a substantially sonic velocity.

77. The method according to claim 68, wherein discharging the gas mixture through the second opening includes discharging the gas mixture at a subsonic velocity.

78. The method according to claim 68, further comprising reducing a level of oxygen contained within the volume of ambient air.

79. The method according to claim 78, wherein reducing a level of oxygen contained within the volume of ambient air further comprises flowing the volume of ambient air over an oxygen reactive material.

80. The method according to claim 79, wherein flowing the volume of ambient air over an oxygen reactive material further comprises flowing the volume of ambient air over a material comprising at least one of iron, copper, nickel, zirconium and titanium.

81. The method according to claim 79, further comprising heating the oxygen reactive material.

82. The method according to claim 81, wherein heating the oxygen reactive material further comprises thermally coupling the oxygen reactive material with a nozzle associated with introducing the fire-suppressing gas into the flow path.

83. The method according to claim 68, further comprising reducing a velocity of the fire-suppressing gas after it is introduced into the flow path and prior to discharging the gas mixture through the second opening.

84. The method according to claim 83, wherein reducing a velocity of the fire-suppressing gas further includes flowing the fire-suppressing gas through a diffuser.

85. The method according to claim 68, further comprising flowing the gas mixture through a conditioning device.

86. The method according to claim 85, wherein flowing the gas mixture through a conditioning device further comprises flowing the gas mixture through an oxygen-getting device.

87. The method according to claim 85, wherein flowing the gas mixture through a conditioning device further comprises flowing the gas mixture through at least one of an NO_X and an NH_3 scavenger.

88. The method according to claim 85, wherein flowing the gas mixture through a conditioning device further comprises flowing the gas mixture through a filter.

89. The method according to claim 85, wherein flowing the gas mixture through a conditioning device further comprises flowing the gas mixture through a heat transfer device.

90. The method according to claim 68, wherein providing a housing with a first opening and a second opening further comprises providing a housing with a first set of openings and a second set of openings.